

ABSTRACT

A charge trapping semiconductor device is field effect transistor (NDR-FET) device is disclosed particularly suited as a replacement for conventional pull-up and load elements such as NDR diodes, passive resistors, and conventional FETs. The NDR-FET device includes a charge trapping layer formed at or extremely near to an interface between a substrate (which can be silicon or SOI) and a gate insulation layer. The charge trapping device can be shut off during static operations to further reduce power dissipation. In this fashion, charge traps can be optimized for extremely rapid trapping and de-trapping of charge because they are extremely close to a channel of hot carriers. The NDR-FET is also useable as a replacement for conventional NDR diode and similar devices in memory cells, and enables an entire family of logic circuits that only require a single channel technology (i.e., instead of CMOS) and yet which provide low power.